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(54) Fat substitute for chocolate

(57) A hard fat substitute for use in chocolate comprising a polyol fatty acid polyester having a high N_{35} and a non-tempering triglyceride having a low N_{35}, wherein the mixture has a low N_{35}, as well as a composite confectionery product comprising a chocolate core coated by a chocolate coating, wherein the chocolate core is based on a 80:20 to 20:80 wt/wt mixture of triglyceride fats and polyol fatty acid polyesters, and the chocolate coating is based on triglyceride fats with no or a small amount of polyol fatty acids in a weight ratio of 100:0 to 90:10.

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FAT COMPOSITIONS FOR CONFECTIONERY

The present invention relates to confectionery products and manufacture, and in particular, although not exclusively, chocolate confectionery products and manufacture. Preferred confectionery products according to the invention are filled confectionery items.
The present invention further relates to novel hard fat substitutes, suitable for these confectionery products.

In the western world there is an increased interest in food products having a reduced caloric content. In the area of confectionery products up to now the focus has been on the reduction of carbohydrates, in particular the sugar component, by using artificial or reduced-calorie sweeteners.

In the general area of low-calorie food products it has been suggested to reduce the caloric content of food products, in particular of the traditionally high-fat food products such as salad dressings, margarines, shortenings, and the like, by replacement of the triglyceride fats by non-adsorbable, non-digestible polyol fatty acid polyesters. Low-calorie food products comprising polyol fatty acid polyesters are disclosed in US 3,600,186.

Polyol fatty acid esters and polyesters have also been suggested for inclusion in confectionery compositions.

In US 2,886,438 chocolate mixes and shortenings comprising upto 5% by weight of the fat of a fatty acid ester of an unsubstituted mono-alkyl-glucoside, such as ethylglucoside stearate are disclosed. The glucoside esters are stated to have beneficial effects upon consistency and appearance.

In EP 0 236 288 the suitability in food products of polyol fatty acid polyesters having a specific viscosity and

stability profile, is described. Among the many types of food applications also chocolates and chocolate confections are mentioned.

In EP 0 271 951 cocoa-butter substitutes made from sucrose polyesters are described. The sucrose polyester is derived from either a combination of lauric and palmitic fatty acids, or, in the alternative, a combination of capric and stearic fatty acids. Such sucrose polyesters are characterised by a relatively high-melting profile, in particular at mouth temperature, and corresponding thereto, in themselves provide poor oral response. They have to be blended with significant amounts of further fat components to achieve an acceptable chocolate-like melting behaviour at mouth temperature.

EP 285,187 relates to chocolate confectionery products containing sucrose polyesters.

EP 350,981 discloses the use of polyol fatty acid polyesters having a specific N-line as a hard-fat substitute for confectionery products. Confectionery products wherein 75 to 100% of the fat is such a polyol fatty acid are also described.

JP 01/137937 describes the preparation of chocolate wherein the fat is a mixture of sucrose fatty acid polyesters containing laurine, lauric or myristic fatty acids and not more than 10% by weight of a lauric acid type hard butter. The sucrose fatty acid polyesters is a cocoa butter like substance which melts at around body temperature ($N_{35}<5$).

It is an object of the present invention to provide confectionery products, in particular chocolate products which are based on a combination of digestible (triglyceride) fats and polyol fatty acid polyesters.

It is a further object of the present invention to provide novel hard-fat substitutes, that are very suitable in above confectionery products.

A problem with confectionery products, especially chocolate products which are based on a combination of digestible fats and polyol fatty acid polyesters is that they often suffer from blooming. Blooming is believed to be enhanced by the heterogenous polymorphic structure of the product formed by the mixture of fats; thereby allowing an increased migration of the ingredients which cause blooming to the surface of the chocolate.

It is a further object of the present invention to provide confectionery products, especially chocolate products with a reduced degree of blooming.

Surprisingly it has been found that blooming can significantly be reduced if the confectionery product comprises a core of chocolate based on a mixture of triglyceride fats and polyol fatty acid polyesters, said core being coated with a thin layer of chocolate which is mainly based on triglyceride fats.

This result is surprising since one would expect that a thin coating layer would not be sufficient to stop the migration of blooming ingredients to the surface of the product. It has been found that already a thin coating layer results in a significant reduction of blooming; the use of such thin layers is clearly preferred since this does not unduly affect the caloric content of the confectionery product.

Accordingly the present invention relates to a composite confectionery product comprising a chocolate core coated by a chocolate coating, wherein the chocolate core is based on a 80:20 to 20:80 wt/wt mixture of triglyceride fats and

polyol fatty acid polyesters, and the chocolate coating is based on triglyceride fats with no or a small amount of polyol fatty acids in a weight ratio of 100:0 to 90:10, wherein the weight ratio of the chocolate core to the chocolate coating is 1:1 to 100:1.

In this specification the term 'confectionery product' is intended to refer to chocolate products, as well as chocolate-like products, the latter not necessarily including any non-fat cocoa flavouring. The term 'chocolate product' is intended to cover all solid, edible fatty products with cocoa, i.e. cocoa-powder or cocoa-liquor, whether or not partially comprising cocoa-butter.

The core chocolate is based on a mixture of triglyceride fats and polyol fatty acid polyesters. With this is meant that the fat of the chocolate is a mixture of triglyceride fats and polyol fatty acid polyesters.

The indigestible polyol fatty acid polyesters employed in the present invention are fatty acid polyesters derived from any aliphatic or aromatic compound which comprises at least four free hydroxyl groups. Such polyols in particular include the group of sugar polyols, which comprises the sugars, i.e. the mono-, di- and polysaccharides, the corresponding sugar alcohols and the derivatives thereof having at least four free hydroxyl groups. Examples of the preferred sugar polyols include glucose, mannose, galactose, xylose, fructose, sorbose, tagatose, ribulose, xylulose, maltose, lactose, cellobiose, raffinose, sucrose, erythritol, mannitol, lactitol, sorbitol, xylitol and alpha-methylglucoside. The sucrose polyol being preferred most.

The degree of conversion to polyester, which is defined as the percentage of polyol hydroxyl groups that, on an

average, have been esterified with fatty acids, should be over 70%, and preferably over 85 or even 95%.

For the purposes of the present invention by indigestibility, which is closely connected to the degree of esterification and the chain lengths of the fatty acid residues, is meant that at least about 70% by weight of the material concerned is not digested.

The fatty acid residues are generally derived from C_8-C_{22} fatty acids, which in view of the required melting characteristics will be predominantly saturated. In general naturally occurring fats and oils may be used as source for the fatty acid residues in the polyol fatty acid polyesters. Conventional techniques may be used to introduce, if necessary, the required degree of saturation. Suitably such techniques include full or partial hydrogenation, interesterification and fractionation, and may be used before or after conversion of the polyols to the corresponding polyol fatty acid polyesters.

The selection of the appropriate composition of fatty acid residues is in particular determined by the required melting characteristics of the resulting polyol fatty acid polyester. In this specification the melting characteristics of a fat or a fat-like substance are defined by its N-line. The N-line is the graph of N_t-values versus the temperature t. The N_t-value is conveniently measured by the nuclear magnetic relaxation technique and is a direct measure of the level of solid fat content at temperature t. This method is suitably described in Fette, Seifen, Anstrichmittel 80(5), 180-186 (1978). To some extent the measurement of N_t-values is dependent on the temperature profile used to prepare the samples for the NMR-measurement. For the purposes of the present invention the following preparatory temperature profile was used: 30 minutes at 80°C, 5 minutes at 60°C, 90 minutes at 0°C, 40

hours at 26°C, 90 minutes at 0°C, finally 60 minutes at the temperature of the measurement, after which the NMR measurement was carried out.

A preferred source of fatty acid residues is a palm oil/palm kernel mixture, for example a 30:70 to 70:30 mixture of fully hardened palm oil and fully hardened palm kernel oil.

The polyol fatty acid polyesters for use in confectionery products of the invention preferably have a N-line characterised by a N_{35} of more than 10, more preferred more than 15, most preferred more than 20. Also preferably the N_{20} of the polyol fatty acid is more than 75, more preferred more than 77, most preferred more than 80.

In a preferred embodiment of the core chocolate of the invention a polyol fatty acid polyester with a high solids content at body temperature is used in combination with a non-tempering triglyceride fat having a relatively low solids content at body temperature. Surprisingly it has been found that the use of these novel mixtures can result in chocolate fats having a solids content at body temperature which is low (even lower than expected on the basis of the solids content of the starting materials) while having a solids content at room temperature which is fairly high.

Accordingly in a preferred embodiment of the invention the core chocolate is based on to a novel hard-fat substitute comprising:

a) a polyol fatty acid polyester having a N_{35} of more than 10; and

b) a non-tempering triglyceride fat having a N_{35} of less than 10 and a N_{20} of more than 50

wherein the weight ratio between (a) and (b) is from 20:80 to 80:20 and the mixture has a N_{35} of less than 10.

In another embodiment of the invention it was found, that above hard-fat substitute is very suitable for the production of chocolate preparations. In general these chocolate preparations, such as bars comprise 20-55 wt%, preferably 30-40 wt% of fat. Preferably 70-100 wt% of the fat is formed by the hard fat substitute of the invention.

As indicated above, preferably the triglyceride fat of the core chocolate is a non-tempering triglyceride fat. For the purpose of the invention the term non-tempering fat has the meaning as generally understood in the art i.e. a fat which will not lead to bloom formation when used in chocolate without a tempering step prior to cooling. For the purpose of the invention cocoa butter is not a non-tempering fat.

Preferred triglyceride fats have a N_{35} of less than 10, more preferred 0 to 10 most preferred 0 to 5. The N_{20} is more than 50, more preferred 70 to 100, most preferred 85 to 97.

Preferably the triglyceride is a so-called lauric cocoa-butter replacer (CBR), which is a fully refined fat predominantly produced from palmkernel and/or coconut oil by means of fractionation, hydrogenation and/or interesterification techniques. In another preferred embodiment of the invention the triglyceride portion of the core chocolate comprises some cocoa butter, or some cocoa butter equivalents.

In any case the total fat portion of the core chocolate must have a melting behaviour which renders it suitable for use in chocolate products. Preferably they have the special property that at room temperature they are hard whereas they melt quickly at body temperature, in particular at mouth temperature.

The mixture of the polyol fatty acid polyester and the triglyceride in the core chocolate preferably has a N_{35}

value of less than 10, more preferred 0 to 8, most preferred 0 to 5. The N_{20} value is preferably more than 75 most preferred 80 to 90.

The polyol fatty acid and the triglyceride in the core chocolate are preferably used in a weight ratio of 30:70 to 70:30, more preferred 35:65 to 65:35 most preferred 40:60 to 60:40.

Preferably from 70 to 100 wt% of the fat in the core chocolate is formed by the above described mixture of polyol fatty acid polyesters and triglycerides, more preferred 80 to 100%, most preferred 90-100%. The remaining of the fat may consist of any fat-like material, although in an especially preferred embodiment of the invention, the remaining fat is cocoa-butter e.g. at a low level resulting from the cocoa flavouring and/or milk fat resulting from the use of milk solids. Inclusion of small amounts is allowed, provided the solids temperature profile of the hard fat blend remains substantially unchanged (i.e. the N_{35} value remains within 2% of the N_{35} value of the hard fat blend).

In addition to the fat component the chocolate core may further comprise one or more conventional chocolate ingredients such as sweeteners, water, suitable flavouring, in particular cocoa powder, chocolate liquor or cocoa mass, nut or fruit flavourings, alcohol-based confection materials, milk solids in the form of skimmed or full milk powder, emulsifier, such as in particular lecithin, anti-oxidants, dietary fibres, and vitamins, such as vitamin E.

Preferably, defatted sources of cocoa flavouring are used in amounts of 5 to 30% by weight of the product, as also de-fatted sources of milk solids, such as in particular skimmed milk powder in amounts of 5 to 25% by weight of the product.

Suitable sweeteners include the common sugars, such as sucrose and raffinose, included in amounts of from 10 to 60%, in particular of from 30 to 50% by weight of the chocolate composition. These conventional sugars may also be replaced by dietetic sweeteners such as sorbitol, fructose, xylitol and lactitol which provide aerated chocolate compositions particularly suitable to avoid tooth decay or in diabetic diets. Such dietetic sweeteners are included at levels between 0.01 and 60% preferably 30 to 55% to provide a sweetening taste comparable to a sugar level of 10 to 60% by weight of the final confectionery filling composition. Inclusion of sorbitol and xylitol have the further advantage to increase the cool-melting sensation of the compositions.

For the purpose of increased cool-melting sensation also effective amounts of in particular dextrose can be included. Suitable amounts range from 5 to 30% by weight of the final product.

It may be of particular advantage to use a low-calorie high-intensity sweetener in combination with the polyol fatty acid polyesters to provide aerated chocolate compositions having an even further reduced caloric content. Suitably such high-intensity sweeteners include aspartame (phenylalanin), saccharin, cyclamate, sucralose, acesulfame-K, thaumatin and mixtures thereof. They are normally included in amounts of from 0.1 to 5% by weight of the product. If so desired, the high-intensity sweeteners may also be used to top up reduced amounts of the common sugars or dietetic sweeteners. High-intensity sweeteners are generally supplemented to the amount of sweeteners they replace, by suitable low-calorie bulking agents, such as polydextrose.

As described hereabove the invention relates to the coating of the core chocolate with a thin coating layer of a

chocolate which is mainly based on triglyceride fats. Although small amounts of polyol fatty acid polyesters may be tolerated it is preferred that the weight ratio of triglyceride fats and polyol fatty acid polyesters in the coating is from 100:1 to 90:10, more preferred 100:1 to 98:1, most preferably the coating chocolate is substantially free from polyol fatty acid polyesters.

The triglyceride fat of the coating chocolate may be any suitable triglyceride chocolate fat e.g. based on cocoa butter, lauric butters and cocoa butter equivalents. Again, the total fat portion of the coating chocolate must have a melting behaviour which renders it suitable for use in chocolate products. Preferable they have the special property that at room temperature they are hard whereas they melt quickly at body temperature, in particular at mouth temperature.

The fat in the coating chocolate preferably has a N_{35} value of less than 10, more preferred 0 to 8, most preferred 0 to 5. The N_{20} value is preferably more than 75 most preferred 80 to 90.

In an especially preferred embodiment of the invention, the triglyceride fat in the coating chocolate is similar to the triglyceride fat in the core chocolate i.e the predominant fat in the two chocolates is the same. For example the two chocolates may both be based on lauric type hard butters.

The weight ratio of core chocolate to coating chocolate is between 1:1 to 75:1, more preferred 1.5:1 to 40:1, most preferred 2:1 to 30:1.

Preferably the coating chocolate is applied to at least 50% of the surface area of the core chocolate, more preferred more than 80%, most preferred the core chocolate is completely (100%) coated with the coating chocolate. The

thickness of the coating layer is preferably from 0.01 to 1.5 mm, more preferred 0.05 to 1.2 mm, most preferred 0.1 to 1.0 mm.

Manufacture of the confectionery products in accordance with the present invention follows the conventional processing techniques in chocolate manufacture including mixing, milling, conching, and moulding. The coating layer may be applied by conventional techniques, for example spraying or dipping. Alternatively the outer coating layer may be shell-moulded and filled with the core chocolate.

The invention will now be further illustrated by way of two examples.

EXAMPLE I

The core chocolate was prepared of the following composition

	parts
cocoa powder (11% fat)	14
SPE (*)	15.5
non-tempering fat (**)	15.5
skimmed milk powder	7
sugar	48
lecithin	0.4

* 1:1 mixture of SPE1 and SPE2. SPE1 is a sucrose polyester of 57% fully hardened palm kernel and 43% fully hardened palm oil and has a N_{35} of 43, degree of esterification over 95%. SPE2 is a sucrose polyester of 62% fully hardened palm kernel and 38% fully hardened palm oil and has a N_{35} of 18 and a degree of esterification of over 95%.

** A Lauric fat (CLSP 555 ex Loders Croklaan) having a N_{20} of 94 and a N_{35} of 4. The mixture of SPE and non-tempering fat had a N_{20} of 85 and a N_{35} of 3.5

The chocolate was prepared by mixing cocoa powder, skimmed milk powder, sugar, lecithin and half of the SPE/fat followed by particle size reduction to less than 25 μm in a three roll refiner. The remaining SPE/fat was incorporated using an endrunner conch and the chocolate was conched for 5 hours at 55°C.

A coating chocolate was made of the following formulation:

	parts
cocoa powder (11% fat)	14
non-tempering fat (**)	31
skimmed milk powder	7
sugar	48
lecithin	0.4

The method of preparing was as indicated above. The coating chocolate was cooled to 35°C and used to coat a plastic twelve portion chocolate mould to form hollow shells. The mould was then cooled to 15°C for 15 minutes to solidify. The core chocolate at 35°C was deposited into the shells and then cooled to 10°C for 30 minutes. Finally, a layer of coating chocolate at 35°C was applied to the back of the bar and the total composite was cooled for 15 minutes. The weight ratio of core chocolate to coating was 2.4 to 1. The thickness of the coating layer was about 0.5 mm.

Both the coated and the uncoated (comparison) chocolate bars were stored at 15°C for 1 month. The coated chocolate did not bloom, while the uncoated chocolate suffered from serious blooming.

EXAMPLE II

Chocolates were prepared of the following composition

	parts
cocoa powder (11% fat)	14
SPE (*)	15.5
non-tempering fat (**)	15.5
skimmed milk powder	7
sugar	48
lecithin	0.4

* 1:1 mixture of SPE1 and SPE2. SPE1 is a sucrose polyester of 57% fully hardened palm kernel and 43% fully hardened palm oil and has a N_{35} of 43, degree of esterification over 95%. SPE2 is a sucrose polyester of 62% fully hardened palm kernel and 38% fully hardened palm oil and has a N_{35} of 18 and a degree of esterification of over 95%.

** A Lauric fat (CLSP 555 ex Loders Croklaan) having a N_{20} of 94 and a N_{35} of 4. The mixture of SPE and non-tempering fat had a N_{20} of 85 and a N_{35} of 3.5

The chocolate was prepared by mixing cocoa powder, skimmed milk powder, sugar, lecithin and half of the SPE/fat followed by particle size reduction to less than 25 μm in a three roll refiner. The remaining SPE/fat was incorporated using an endrunner conch and the chocolate was conched for 5 hours at 55°C. The chocolate was cooled to 45°C and deposited into plastic moulds which were cooled in a cooling tunnel at 10°C for 40 minutes. Bars of chocolate were stored at 15, 20 and 25°C for 6 months.

The chocolates had a good firmness, melted clearly in the mouth and had a good mouthfeel with no waxiness or fatty taste. This is surprising as one would expect that the use of SPE's having a high N_{35} in combination with a Lauric fat having a N_{35} of 4 would provide chocolates with an unacceptable mouthfeel.

CLAIMS

1. A composite confectionery product comprising a chocolate core coated by a chocolate coating, wherein the chocolate core is based on a 80:20 to 20:80 wt/wt mixture of triglyceride fats and polyol fatty acid polyesters, and the chocolate coating is based on triglyceride fats with no or a small amount of polyol fatty acids in a weight ratio of 100:0 to 90:10, wherein the weight ratio of the chocolate core to the chocolate coating is 1:1 to 75:1.

2. A confectionery product according to claim 1 wherein the thickness of the coating layer is from 0.01 to 1.5 mm, more preferred 0.05 to 1.2 mm, most preferred 01 to 1.0 mm.

3. A confectionery product, according to claim 1 or 2, wherein the triglyceride fat in the coating chocolate is similar to the triglyceride fat in the core chocolate.

4. A hard-fat substitute suitable for use in chocolate comprising a mixture of

   a) a polyol fatty acid polyester having a N_{35} of more than 10; and
   b) a non-tempering triglyceride fat having a N_{35} of less than 10 and a N_{20} of more than 50

   wherein the weight ratio between (a) and (b) is from 20:80 to 80:20 and the mixture has a N_{35} of less than 10.

5. Use of a hard fat substitute according to claim 1 in confectionery products, preferably chocolate confectionery products.

Patents Act 1977 15
Examiner's report to the Comptroller under Section 17
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Relevant Technical Fields

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14 DECEMBER 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant following a search in respect of Claims :-
1-3

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
A	EP 0416665 A2	(UNILEVER) whole document	1
A	EP 0378876 A2	(UNILEVER) page 4 lines 23-29	1
A	EP 0377237 A2	(UNILEVER) column 5 lines 9-23	1

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